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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/668,638	09/22/2003	Malcolm H. Smith	884.A48US1	2175

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SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH
1600 TCF TOWER
121 SOUTH EIGHT STREET
MINNEAPOLIS, MN 55402

EXAMINER	
JACKSON, BLANE J	
ART UNIT	**PAPER NUMBER**
2618	

DATE MAILED: 03/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/668,638	SMITH ET AL.	
	Examiner	**Art Unit**	
	Blane J. Jackson	2685	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 September 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *23-28* is/are allowed.

6)☒ Claim(s) *1-3,8-11,13-17,29 and 30* is/are rejected.

7)☒ Claim(s) *4-7,12,18-22 and 31-37* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 8, 9, 29 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Filipovic (US 2004/0120421) in view of Ugajin et al. (US 6,549,074).

As to claim 1, Filipovic teaches an apparatus comprising:

A mixer to convert an RF signal to a baseband differential signal (figure 3A, first receiver (14B) provides a zero IF architecture of IEEE 802.11g RF signal direct to baseband, paragraphs 0036-0038),

A transcoductance-capacitor (GmC) filter to filter the baseband differential signal (GmC analog filter (16B), paragraph 0038).

Filipovic is silent as to the configuration of the GmC filter that comprises a first and second transconductance-capacitor circuits in series and a transconductance-feedback circuit in feedback with the second transconductance-capacitor circuit.

Ugajin teaches a transconductance capacitor filter and tuning circuitry comprising a first (31a) and second (31b) transconductance-capacitor circuits (with capacitors (31e-31j) in series and a transconductance feedback circuit in feedback with the second

transconductance-capacitor circuit, figure 3, transconductance amplifier (31d) forms the feedback with the second (31b) amplifier, column 11, lines 43-57.

Since Ugajin teaches the GmC amplifier is suitable for low-power LSI used in portable radio equipment, it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the conventional GmC filter of Filipovic as the configuration taught by Ugajin which can be operated at a lower source voltage, maintain a high output impedance, wide output dynamic range and tuning circuitry for tuning a gain of the transconductance amplifier in the filter.

As to claim 8 with respect to claim 1, Ugajin of Filipovic modified teaches two trans conductance amplifier with capacitors applied has at least two poles and

Wherein the first transconductance capacitor circuit is to provide a first pole for the GmC filter corresponding to an output pole of the mixer (figure 3, transconductance amplifier (31a) and capacitors (31e and 31f),

Wherein the second transconductance capacitor circuit and the transconductance feedback circuit are to provide a second pole of the GmC filter (Gm (31b) and feedback GmC (31d) plus differential capacitors (31g and 31h).

AS to claim 9 with respect to claim 1, Filipovic modified is silent as to at least one of either the first or second transconductance capacitor circuits comprises a cross-coupled pairs of transistors to receive the baseband differential signal and generate a differential output current.

Koyama teaches several embodiments for specific circuit architecture for a transconductance filter amplifier, figures 1-13. Koyama specifically teaches the circuit of figure 2 comprising:

cross coupled pairs of transistors to receive the baseband differential signal and generate a differential output current and load capacitor (17) to from a differential low pass filter, column 7, lines 28-54. The load capacitor is expressed as a differential capacitance but generally connected between positive and negative signal lines and a ground potential for the reason of ease in setting capacitance.

First and second current sources coupled respectively to the first and second internal feedback nodes to draw current through the transistor for generating the differential output current (current sources 15 and 16, column 7, lines 44-48),

A feedback resistor coupled between the internal feedback nodes (figures 2 and 26, column 6, lines 30-39: voltage controlled FET (18) is variable resistance element as identified for figure 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to realize the transconductance amplifier of Filipovic modified in the configuration of Koyama such that this integration circuit has an expanded linear input range.

As to claim 29, Filipovic teaches a system comprising:

An omnidirectional antenna to receive an Rf signal (figures 1 and 3b, paragraph 0022),

In-phase (I) channel and quadrature-phase (Q) channel mixers to convert the received RF signal to baseband-differential signals (paragraphs 0041-0043),

I and Q channel transconductance-capacitor (GMC filters to filter the baseband differential signal (figure 3B, GmC analog filter (16B), paragraph 0043).

Filipovic is silent as to the configuration of the GmC filter that comprises a first and second transconductance-capacitor circuits in series and a transconductance-feedback circuit in feedback with the second transconductance-capacitor circuit.

Ugajin teaches a transconductance capacitor filter and tuning circuitry comprising a first (31a) and second (31b) transconductance-capacitor circuits (with capacitors (31e-31j) in series and a transconductance feedback circuit in feedback with the second transconductance-capacitor circuit, figure 3, transconductance amplifier (31d) forms the feedback with the second (31b) amplifier, column 11, lines 43-57.

Since Ugajin teaches the GmC amplifier is suitable for low-power LSI used in portable radio equipment, it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the conventional GmC filter of Filipovic as the configuration taught by Ugajin which can be operated at a lower source voltage, maintain a high output impedance, wide output dynamic range and tuning circuitry for tuning a gain of the transconductance amplifier in the filter.

As to claim 30, Filipovic teaches the system of claim 29 further comprising a low noise amplifier (LNA) to amplify and provide the received RF signal to the I channel mixer and the Q channel mixer (wireless receivers of a plurality of communication

protocols inherently including a LNA between the antenna and quadrature mixers, paragraphs 0005 and 0022).

Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Filipovic (US 2004/0120421) and Ugajin et al. (US 6,549,074) and further in view of Koyama et al. (US 5,384,501).

As to claim 2 with respect to claim 1, Ugajin of Filipovic modified teaches at least one of either the first or second transconductance-capacitor circuits comprises first and second capacitors coupled respectively between differential inputs of the at least one transconductance-capacitor circuit and first and second *ground nodes* of the at least one transconductance capacitor circuit (figure 3, capacitors (31e and 31f) between the differential inputs and a ground feedback node of first transconductance amplifier (31a)).

Filipovic modified is silent as to at least one of either the first or second transconductance capacitor circuits comprises a cross-coupled pairs of transistors to receive the baseband differential signal and generate a differential output current.

Koyama teaches several embodiments for specific circuit architecture for a transconductance filter amplifier, figures 1-13. Koyama specifically teaches the circuit of figure 2 comprising cross coupled pairs of transistors to receive the baseband differential signal and generate a differential output current and load capacitor (17) to from a differential low pass filter, column 7, lines 28-54. The load capacitor is expressed as a differential capacitance in the output but is understood to be alternatively

connected from the positive and negative signal input/ output lines and an equivalent ground potential for the reason of ease in setting capacitance.

It would have been obvious to one of ordinary skill in the art at the time of the invention to realize the transconductance amplifier of Filipovic modified in the configuration of Koyama such that this integration circuit has an expanded linear input range.

As to claim 3 with respect to claim 2, Filipovic modified does not teach wherein the differential output current is substantially proportional to a differential input voltage of the baseband differential signal.

Koyama teaches the differential output current is substantially proportional to a differential input voltage of the baseband differential signal (column 7, lines 33-54),

Wherein the at least one transconductance capacitor circuits further comprises:

First and second current sources coupled respectively to the first and second internal feedback nodes to draw current through the transistor for generating the differential output current (current sources 15 and 16, column 7, lines 44-48),

A feedback resistor coupled between the internal feedback nodes (figures 2 and 26, column 6, lines 30-39: voltage controlled FET (18) is variable resistance element as identified for figure 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to realize the GmC circuit of Filipovic modified with the specific current source

configuration of Koyama to properly determine the current value of the differential amplifier.

Claims 10, 11 and 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Filipovic (US 2004/0120421) and Ugajin et al. (US 6,549,074) and further in view of Zocher et al. (6,400,218).

As to claims 10 and 11 with respect to claim 1, Filipovic teaches the general architecture of a direct conversion quadrature receiver utilizing a GmC filter in the baseband (figures 3a and 3b, paragraphs 0027, 0038 and 0041-0043) but is silent to the circuit comprising a low noise amplifier and a voltage butter at the output of the GmC filter.

Zocker teaches a direct conversion quadrature receiver comprising:

A low noise amplifier to amplify and provide a received RF signal to the mixer (figure 1, LNA (106),

A voltage buffer to receive the filtered baseband differential signal from the GmC filter to provide an output differential signal to an analog to digital converter (ADC) (figure 4 teaches a GmC filter that may be substituted for the low pass filters of figure 1, filters (112) and (113), column 2, lines 21-50 where the last Gm stage, including input impedance is inversely proportional to the gain, would serve as a differential voltage buffer amplifier prior to the ADC, column 3, lines 50-64).

It would have been obvious to one skilled in the art at the time of the invention to realize in the receiver architecture of Filipovic modified the RF and baseband amplifiers of Zocker to maintain the required system gain and noise performance.

As to claim 13, Filipovic teaches the apparatus of claim 10 wherein the RF signal comprises signals at either approximately 2.4 GHz or 5.0 GHz (receivers applicable to IEEE 802.11 protocol standards, paragraph 0018).

As to claim 14, Filipovic teaches the apparatus of claim 10 wherein the RF signal comprises wideband code division multiple access signals (application to known and developing wireless communication standards including BPSK, QPSK, FDMA, TDMA and CDMA and by inherent extension, WCDMA, paragraphs 0002-0005).

As to claim 15, Filipovic teaches the apparatus of claim 10 wherein the RF signal contains OFDM signals having symbol modulated orthogonal subcarriers (application to known and developing wireless communication standards including CDMA comprising forms of orthogonal codes, paragraphs 0002-0005).

Claims 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ugajin et al. (US 6,549,074) in view of Koyama et al. (US 5,384,501).

As to claim 16, Ugajin teaches an apparatus comprising:

a transconductance capacitor filter and tuning circuitry comprising a first (31a) and second (31b) transconductance-capacitor circuits (with capacitors (31e-31j) in series (figure 3, column 11, lines 43-63),

A transconductance feedback circuit in feedback with the second transconductance-capacitor circuit (figure 3, transconductance amplifier (31d) forms the feedback with the second (31b) amplifier, column 11, lines 43-57), and

First and second capacitors coupled respectively between differential inputs of the at least one transconductance capacitor circuit and *first and second ground nodes* of the at least one transconductance-capacitor circuit.

Ugajin does not each the first or second transconductance-capacitor circuits comprises cross-coupled pairs of transistors.

Koyama teaches several embodiments for specific circuit architecture for a transconductance filter amplifier, figures 1-13. Koyama specifically teaches the circuit of figure 2 comprising cross coupled pairs of transistors to receive the baseband differential signal and generate a differential output current and load capacitor (17) to from a differential low pass filter, column 7, lines 28-54. The load capacitor is expressed as a differential capacitance in the output but is understood to be alternatively connected from the positive and negative signal input/ output lines and an equivalent ground potential for the reason of ease in setting capacitance.

It would have been obvious to one of ordinary skill in the art at the time of the invention to realize the transconductance amplifier of Filipovic modified in the

configuration of Koyama such that this integration circuit has an expanded linear input range.

As to claim 17 with respect to claim 16, Ugajin does not teach wherein the differential output current is substantially proportional to a differential input voltage of the baseband differential signal.

Koyama teaches the differential output current is substantially proportional to a differential input voltage of the baseband differential signal (column 7, lines 33-54),

Wherein the at least one transconductance capacitor circuits further comprises:

First and second current sources coupled respectively to the first and second internal feedback nodes to draw current through the transistor for generating the differential output current (current sources 15 and 16, column 7, lines 44-48),

A feedback resistor coupled between the internal feedback nodes (figures 2 and 26, column 6, lines 30-39: voltage controlled FET (18) is variable resistance element as identified for figure 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to realize the GmC circuit of Ugajin with the specific current source configuration of Koyama to properly determine the current value of the differential amplifier.

Allowable Subject Matter

Claims 4-7, 12, 18-22 and 31-37 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. As to claim 2, the prior art teaches bandwidth control via control of the transfer current not by a voltage dependent capacitor.

Claims 23-28 are allowed.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Aram (US 7,002,409), Mitteregger (US 2003/0146789) and Hasegawa (US 2002/0163384).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Blane J. Jackson whose telephone number is (571) 272-7890. The examiner can normally be reached on Monday through Friday, 8:00 AM-5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Urban can be reached on (571) 272-7899. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

BJJ

EDWARD F. URBAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600